The Examiner states that the first method step of Applicant's invention of Claim 1, "determining the underlying security" is taught by Sandretto, at col. 12, lines 20-40. Applicant respectfully disagrees. That passage is describing "equat[ing] the risk premium for one or more asset classes, such as U.S. stocks or U.K. Treasury securities" based on some seemingly unspecified criteria. That passage does not mention determining an underlying security for a derivative, whose value is based on the underlying security. In fact, that passage supports Applicant's invention. At lines 36 to 40, Sandretto states that, "current methods of comparing the price of corporate stocks with the price of U.S. Treasury securities probably rely more on judgement [sic] and on statistics than on formal risk-return analysis." Applicant's invention comprises a formal risk-return analysis, that had not been previously achieved.

The Examiner next states that the method step of Applicant's invention of Claim 1, "determining the type of derivative" is taught by Sandretto, at col. 9, lines 55-65. Applicant respectfully disagrees. Sandretto at col. 9, lines 55-65 does not disclose any types of derivatives, and he barely claims that his method can be used for "derivative assets (assets derived from other assets)". "Determining the type of derivative" is important for pricing. Prior to pricing a derivative, it is necessary to determine what type of derivative it is. For example, prices of derivatives such options on stocks, options on indexes, futures, and options on futures, competitively traded on the derivatives exchanges such as Chicago Board of Options Exchange (CBOE) or Chicago Mercantile Exchange (CME) derivatives differ and depend on the particulars of each derivative. For instance, the exchanges simultaneously quote call options and put options on different underlying securities with different strikes, different expirations, and different early exercise rights. Each of these derivatives has its unique pay-off value with respect

to its corresponding underlying security (from which it is "derived") at the time of its expiration or early exercise determined by derivative contract specification and the price of the underlying security at, and/or prior to, that time. For instance, call options pay-offs differs from put options pay-offs and so on. Pricing of the derivatives before their expiration depends on all these detailed derivatives specifications, and on the underlying securities prices, and thus this information needs to be determined in detail prior to its pricing. Sandretto does not provide any of these details necessary for the derivatives pricing. Moreover, pricing of derivatives is intimately related to the price of their underlying securities at any given time. Sandretto does not teach how this relationship affects the price of the derivatives during its lifetime qualitatively or quantitatively. On the other hand, Applicant's invention processes the derivatives specification and characteristics as described in Applicant's Application on pages 12 lines 11-17,13 lines 6-22,14 lines 1-8; 15 lines 10-17, and in Figure 1. Applicant's invention formulates a step-by-step method of accurately pricing derivative securities by choosing appropriate inputs, quantifying identifiable relevant risk factors, formulating appropriate pricing equations, and then solving pricing equations that define the risk-adjusted value of the derivative security with respect to the value of the underlying security in the equations (1) through (24). In fact, Sandretto could use Applicant's invention risk adjusted pricing methodology as an input for the valuation of the derivatives securities as he would use other available pricing derivatives pricing methodologies if he needs to. But, Sandretto does not disclose choosing, or how to choose, or quantifying the inputs that Applicant's invention teaches.

The Examiner next states that the method step of Applicant's invention of Claim 1, "determining the risks associated with said derivative" is taught by Sandretto, at col. 3, lines 20-65. Applicant respectfully disagrees. Sandretto does not determine what are the specific risks

and risk premiums to be considered for pricing a derivative security, such as the underlying security price gap risk, implied volatility risk premium (*i.e.* derivative's price gap risk premium), positive variance of the delta-hedged portfolio risk premium, or trading cost risk premiums. Nor does he teach how to quantitatively determine their value and impact on the price of the derivative security. Sandretto merely states, in a circular definition in a cursory fashion, that his invention relates to estimating "...(4) a risk premium or premiums for one or more asset classes based on a risk premium or premiums for one or more other asset classes," at Col. 3, lines 33-38, though it is true that he does not guarantee convergence of his iterative process of estimation. Sandretto does not provide any method to quantitatively consistently estimate appropriate premiums for the specific risks and costs, just barely states that the risk should be determined. Neither the well known economic theory of capital asset pricing model (CAPM), nor the APT model that Sandretto mentioned in columns 4-8, deals with derivatives pricing, in fact. Derivative securities such as options or futures typically have their value much more tightly and precisely related to their corresponding underlying securities, indexes, or commodities. Their value at their expiration is uniquely defined. On the other hand, assets studied by CAPM, and related models (CAPM models), do not have any expiration and they do not have any predefined guaranteed value. Despite its name, CAPM is not a pricing model. CAPM is a tool for studying portfolios of assets that relates their historical returns with their variance. It ignores costs of trading, and is not applicable to derivatives pricing. Since there are no tight relationships between assets studied by CAPM (as opposed to the tight relation between derivatives and their corresponding underlying securities), very basic statistical assumptions and methodology of continuous (no price gaps) Brownian motion are used by CAPM to model the expected future cash flows. CAPM assumes that the historically realized price volatility and correlations of

individual assets are equal to the expected future price volatility. In CAPM models, this historical variance of asset returns (and thus prices) relative to the variance of portfolio returns (and thus prices) is essentially Sandretto's risk measure beta ("β") - a measure of the relative assets "riskiness". The higher the volatility the riskier the asset is. Thus, Sandretto's risk measure has nothing to do with underlying price gap or implied volatility price risks that the Applicant's invention analytically incorporated in the valuation of the derivatives, via equation (5) and corresponding equations.

The Examiner next states that the method step of Applicant's invention of Claim 1, "determining the trading costs associated with said derivative" is taught by Sandretto, at col. 2, lines 30-40 and col. 3, lines 5-20. Applicant respectfully disagrees. Sandretto does not disclose trading costs associated with said derivative. Sandretto mentions a word "cost" in a context of "asset's original cost", at col. 2, line 42, but he does not deal with, nor does he teach how to adjust, the pricing of the derivatives for the cost of trading associated with their valuation methodology. Determining the trading costs associated with said derivatives is an essential part of any valuation process. In order to apply the methodology of Applicant's invented Risk Adjusted Pricing methodology (RAP), as well as in the prior art of Nobel Prize winning Risk Neutral Pricing methodology (RNP), one must construct a so-called hedge portfolio (containing the derivative and the underlying security) and adjust its composition during the lifetime of the derivative. This adjustment means that one has to buy or sell the underlying security. In the idealized RNP, this trading is done continuously in infinitesimal increments and is costless. In the real world, and in Applicant's invention RAP model, trading is done in discrete time intervals, in discrete amounts, and has cost associated with each transaction. The cost may consist for example of the difference between the bid and offer prices, the exchange fees, or short

selling tax. Even in competitive markets, these trading costs may get extremely high if one tries to adjust the portfolio too often. Therefore, it is important to include trading costs in the pricing. Applicant's invention provides a direct way to not only include the rate of trading costs in the derivative pricing equation, but it also generates a prescription for an optimal hedging strategy maximizing the net value of the derivative.

The Examiner next states that the method step of Applicant's invention of Claim 1, "formulating the risk-adjusted pricing (RAP) equation for said derivative" is taught by Sandretto, at the Summary of the Invention, lines 50-65 and col. 9, lines 5-55. Applicant respectfully disagrees. Sandretto does not disclose any risk-adjusted pricing (RAP) equation for derivatives. In the Summary of the Invention, lines 50-65 Sandretto states that he provides "a method and apparatus to estimate an asset's risk and NPV", that "(1) estimates an asset's operating, financing and accounting characteristics, (2) estimates general and sector economic relations, and (3) estimates certain current economic conditions, such as interest rates". The result of this method and apparatus cannot be applied to theoretical valuation of the derivatives, since he does not include any derivative specific information as we have already noticed above. But Sandretto's method may be used for economic valuation of the value of the underlying assets. Applicant's invention of derivatives pricing does not deal with the underlying asset financing and accounting, general or sector economic relations, or estimates of certain economic conditions. It deals with these factors indirectly via price of the underlying security (an asset, if the underlying is an asset), by which it is defined. Applicant's invention assumes that the current price (market value) of the underlying security reflects all these factors. Moreover, Applicant's invention incorporates all expected risk and market characteristics of the underlying security, *e.g.* probability of the underlying price gaps in the future, or the expected level of the market bid/ask

spreads. CAPM's and Sandretto's meaning of "risk measure" come from continuous framework of Risk Neutral Pricing methodology (RNP), on which it is based. This "risk measure" corresponds to what in the derivatives pricing theory is referred to as volatility of the underlying price. Risks and risk premiums in the Applicant's invention of Risk Adjusted Pricing (RAP) relate to events and price changes that were not able to be included in the continuous framework of the RNP. Sandretto does not discuss how to include the probability of discontinuous price gaps into his cash flows estimation and NPV calculations, and hence does not create an equation that would reflect these risks, nor their affect on the derivatives pricing.

The Examiner next states that the method step of Applicant's invention of Claim 1, "solving said RAP equation for said derivative using numerical methods" is taught by Sandretto, at col. 4, lines 35-55, and col. 8, lines 5-30. Applicant respectfully disagrees. Since Sandretto does not provide any derivatives pricing characteristics, and since he does not have any RAP equation, he cannot teach how to solve a RAP equation for said derivative using numerical methods. Sandretto at col. 4, lines 35-55 describes simple CAPM's regression process where historical returns on individual assets are correlated with a return of market portfolio resulting in a forecast of the next time step return of the assets with respect to the market portfolio. This forecasting does not relate in any way to derivatives pricing, nor does it solve, nor is it a numerical method, for solving the RAP equation. Sandretto at col. 8, lines 5-30 just discusses U.S. Pat. No. 3,270,170 to Lambert (Aug. 30, 1969) and states that Lambert "does not adjust for risk" and that it "involves no numerical processes other than simple linear regression and multiplication". And thus it also does not solve the RAP equation.

The Examiner next states that the method step of Applicant's invention of Claim 1, "outputting a value for said derivative based on said solving of said RAP equation" is taught by

Sandretto, at col. 47, lines 5-65, col. 48, lines 40-65, col. 49, lines 5-20, and col. 50, lines 45-50. Applicant respectfully disagrees. Sandretto does not have or deal with RAP derivatives pricing equation in the first place. Sandretto's risk measures "betas" for the assets are just what in the derivatives pricing theory would be called a measure of expected individual asset variance relative with respect to the variance of the market portfolio and does not relate to a risk premium that enter into RAP equation. Sandretto in col. 49, lines 5-20, and col. 50, lines 45-50 describes part of his apparatus of iteratively trying different the values for his process to see if the result fits within certain range. Applicant's solving RAP equations generates pricing of the derivative with respect to a price of the corresponding underlying security. Solving the RAP equation also generates sensitivities of the change of the derivative's value with respect to a change of the corresponding underlying security (known as a "delta") or time to expiration. These are the partial derivatives (mathematical terminology) of the solution. Sandretto does not talk about these relations in his invention.

The Examiner next states that the element of Applicant's invention of Claim 2, "an input unit taking an input of derivative characteristics and model parameters" is taught by Sandretto, at col. 9, lines 5-20, col. 11, lines 5-65, col. 13, lines 5-50, col. 15, lines 5-65, col. 16, lines 5-65, col. 17, lines 5-45, and col. 18, lines 5-60. Applicant respectfully disagrees. In neither of the cited columns, or even the whole invention does Sandretto describe derivative characteristics such as strike price, option type, time to maturity, nor model parameters such as implied underlying volatility, trading cost coefficient, gap risk coefficient, that are as an input necessary for solving the RAP equation as specified in the Applicant's invention page 15, lines 15-25.

The Examiner next states that the element of Applicant's invention of Claim 2, "a processing unit taking said input factors and computing a value for said derivative based on at

least one of said inputs using a risk-adjusted pricing equation" is taught by Sandretto, at col. 4, lines 5-55, col. 5, lines 5-60, col. 6, lines 5-65, and col. 12, lines 5-40. Applicant respectfully disagrees. Sandretto does not have a unit that takes said input factors and thus could not compute derivative values based on them.

The Examiner next states that the element of Applicant's invention of Claim 2, "an output unit displaying said value of said derivative" is taught by Sandretto, at col. 5. Applicant respectfully disagrees. Similarly to the statements above, Sandretto does not teach how to price a derivative security and thus does not display said value of the derivative, neither at col. 5 nor anywhere else.

Applicant further believes that the Claims are patentable over the prior art of record. Applicant respectfully asserts that Sandretto fails to teach the claimed invention and, in fact, supports the claimed invention.

Conclusion

For all the foregoing reasons, applicant believes the claims are in condition for allowance and respectfully requests that the Examiner allow Claims 1 and to issue.

Please charge any additional fees or credit any overpayment that may be incurred by the Applicant to Deposit Account No. 13-0017 (McAndrews, Held & Malloy, Ltd.).

Respectfully submitted,

Date: May 22, 2002

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